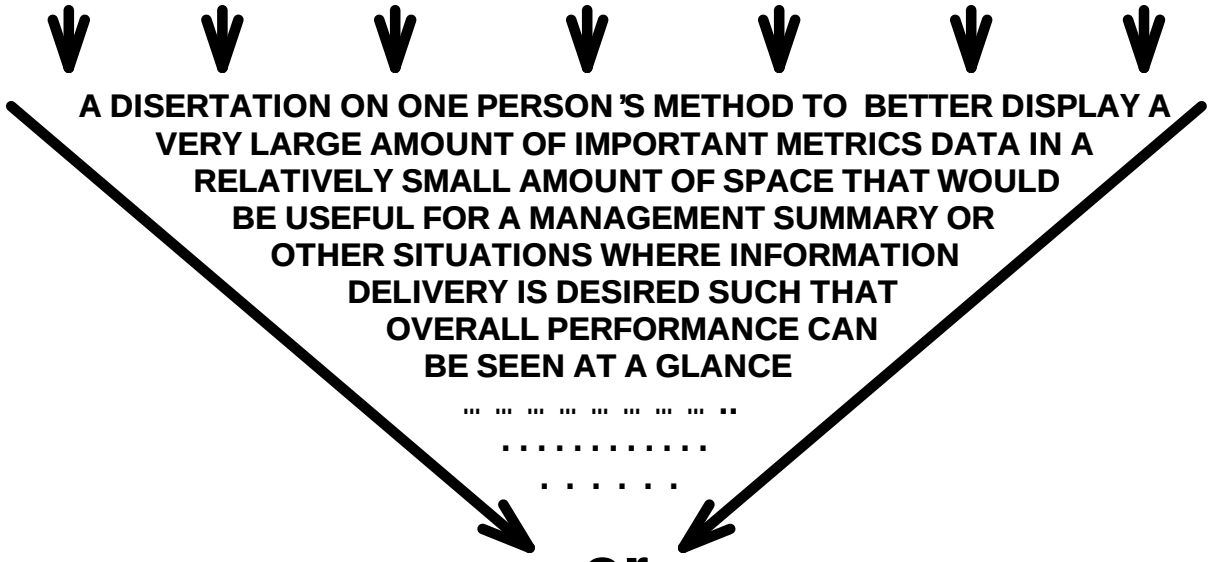

PERFORMANCE INDEXING

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DEFINITIONS

Performance Indicator

Any of various values that collectively provide an indication of the stability of a system. It is a measurable parameter that may be used to suggest the condition of, or trend in, a particular program.

Performance indicators are divided into two groups: (1) organizational indicators are concerned with personnel exposures and (2) facility indicators that are concerned with radiological conditions within buildings. Performance indicators should be selected such that they inform management and trigger improvements. They should be meaningful and measurable. Avoid selecting "pet" indicators. The litmus test is that if an indictor does not inform or have the potential to trigger performance, then get rid of it or do not use it in the first place. The indicator should be measurable during the performance period. Indicators should be selected after careful review of the process being measured (indexed), and after the selections have been made one must be ready to defend the selection process. Defense not only includes those selected, but those not selected (maybe someone else's "pet" indicator). Indicator consistency is an important requirement for tracking and trending. Changing indicators each performance period will accomplish nothing but "bean counting". Indicators can be easily manipulated, even more so within an index. Avoid manipulation of indicators selected for an index. An index showing improvement one performance period cannot be allowed to be removed from the index when it begins displaying poor performance.

Performance Goal

A numerical value chosen for a performance indicator to provide a target for improving the radiation protection program.

Performance indicators within an index mean nothing without goals. The goal chosen should be challenging but achievable. It's selection is based upon historical experience, activities expected to be performed during the goal period and professional judgment. As with the performance indicator, the goal selection must be open to review and challenge.

Performance Index

A technique for measuring, tracking and graphically displaying performance. A management tool allowing for multiple sets of information to be compiled into an overall measure (score).

An index facilitates the consistent deployment of the performance indicator program throughout the organization. It presents multiple sets of information from several related or even non-related performance indicators simultaneously. An index allows a manager to see "overall" trends and performance at a single glance. It is a statistical measure of how performance changes over time (i.e. trending).

INTRODUCTION

How do you determine the overall condition of the stock market (if so inclined)? Do you review each of the over 5000 companies being traded and then determine the overall trends? Or do you look at the Dow Jones Industrial Average, or the Standard and Poors 500? Either of the two just mentioned systems are examples of an "index"

The philosophy behind using a performance index is simple, it condenses a great deal of information into one number. The index is at its most useful when dealing with multiple performance indicators. If you are only interested in one indicator, then one can easily and quickly determine trends and performance without an index. The beauty of an index lies in its condensation of multiple indicators, usually more than five. An index allows one to see the overall trend even when some of the indicators are improving and some are not improving and even others are remaining constant. Not to be repetitious, but the purpose of an index is to give a quick, overall picture of performance.

Where does it help?

It helps in tracking multiple measures simultaneously. It establishes clearly defined improvement goals and sets a timetable for meeting or exceeding those goals. The index displays progress towards those goals on a simple graph and even helps identify areas that need immediate attention.

How is it used?

The index utilizes a set of performance indicators that are assigned weighting factors depending on the indicator's importance to the overall program. Each indicator will yield a score dependent upon the performance period. Performance is measured and a score is calculated and then plotted graphically.

The steps in completing a performance index may appear complicated at first because a lot of information must be reviewed initially, but the end result is a simple graph that clearly shows progress for several performance indicators at once. One important thing to remember is that the individual performance indicators that go into an index do not disappear, their detailed information is still available for review should the index indicate a problem. A performance index can be used in any performance program with metrics, it does not have to be radiation protection. For example, a leading proponent for the index is Eastman Kodak Company where they currently use the index in their industrial safety program.

EXAMPLES OF PERFORMANCE INDEXES

There is no set method for index development. The method shown in this paper is the one utilized by Eastman Kodak, but there are others in use. Two of the different types of index are shown below.

DOE Occupational Injury/Illness Cost Index

$$\text{Index Score} = \frac{100\,[\,(W_1 \times P_1) + (W_2 \times P_2) + \ldots + (W_n \times P_n)\,]}{\text{Total Hours Worked}}$$

W = weighting factor
P = individual measurements (metrics)

Westinghouse Hanford Conduct of Operations Event Index

An index that tracks the number of reportable occurrences (DOE O232.1) per 200,000 hours worked.

$$\text{Index Score} = \frac{O_a + O_b + \ldots + O_g}{H/200{,}000}$$

O = number of occurrence reports in a particular category
H = person-hours worked

STEPS FOR COMPLETION OF A PERFORMANCE INDEX AS UTILIZED BY THE DOSE OPTIMIZATION TEAM, RADIATION PROTECTION SERVICES (ESH-12)

Step 1

Determine the *performance indicators* to be used in the index. Select indicators that are related to, and that measure progress in, the area for which you intend to develop an index. The number of indicators chosen should be at least five or greater, and the index works best with ten or more. Any less than five and the index is probably not needed. It would be easier to look at the individual indicators and ascertain their performance trends.

Performance Index														
Performance Period =														
	Performance Level										Calculations			
Performance Indicator	1	2	3	4	5	6	7	8	9	10	Value	Level	Wt.	Score
A														
B														
C														
D														
X														
Y														
Z														
											Total Index Wt.=			
			Baseline				Goal			Stretch Goal				
c:\files\excel\index\step01.xls												Index Score=		

Step 2

Establish the respective *weights* (wt.) for the indicators. For each indicator a determination should be made as to its relative importance and the impact that it should have on the index.

The setting of weights is a very subjective process. Two things to keep in mind are;
(1) the most critical performance indicators should carry the heaviest weights. For example, in the area of radiation protection a performance indicator of “external exposure” should be weighted heavier than a performance indicator of “anti-c” contaminations.
(2) the weights must remain constant throughout the period of comparison.
The sum of all weights must be equal to 100, no more, no less.

Step 2 (cont.)

Performance Index														
Performance Period =														
	Performance Level										Calculations			
Performance Indicator	1	2	3	4	5	6	7	8	9	10	Value	Level	Wt.	Score
A													45	
B													30	
C													10	
X													5	
Y													5	
Z													5	
											Total Index Wt.=		100	
			Baseline				Goal			Stretch Goal				
c:\files\excel\index\step02.xls											Index Score=			

Step 3

Establish the *baseline* value (level 3 in the matrix) for each indicator.

A good baseline might be a four quarter average or the maximum recorded value up to the time the index is being created. The baseline is your "starting" point so care should be exercised in its selection.

Performance Index														
Performance Period =														
	Performance Level										Calculations			
Performance Indicator	1	2	3	4	5	6	7	8	9	10	Value	Level	Wt.	Score
A			400										45	
B			35										30	
C			7										10	
X			90										5	
Y			3										5	
Z			100										5	
											Total Index Wt.=		100	
			Baseline				Goal			Stretch Goal				
c:\files\excel\index\step03.xls											Index Score=			

Step 4

Determine a *goal* for each indicator.

Performance Index														
Performance Period =														
	Performance Level										Calculations			
Performance Indicator	1	2	3	4	5	6	7	8	9	10	Value	Level	Wt.	Score
A			400				200						45	
B			35				15						30	
C			7				3						10	
X			90				50						5	
Y			3				1						5	
Z			100				20						5	
											Total Index Wt.=		100	
c:\files\excel\index\step04.xls			Baseline				Goal			Stretch Goal	Index Score=			

Step 5

Determine a *stretch goal* for each indicator.

This goal should be challenging but attainable. It should be set such that attainment is only accomplished through superb performance.

Performance Index														
Performance Period =														
	Performance Level										Calculations			
Performance Indicator	1	2	3	4	5	6	7	8	9	10	Value	Level	Wt.	Score
A			400				200			50			45	
B			35				15			0			30	
C			7				3			0			10	
X			90				50			0			5	
Y			3				1			0			5	
Z			100				20			5			5	
											Total Index Wt.=		100	
c:\files\excel\index\step05.xls			Baseline				Goal			Stretch Goal	Index Score=			

Step 6

Establish *intermediate values* for levels 1, 2, 4, 5, 6, 8, 9.
These can be specific milestones determined by line management, or they can be simply mathematical increments between the baseline, goal and stretch goal.
After step 6 is completed the matrix is now ready to be used.

Performance Index

Performance Period =

	Performance Level										Calculations			
Performance Indicator	1	2	3	4	5	6	7	8	9	10	Value	Level	Wt.	Score
A	500	450	400	350	300	250	200	150	100	50			45	
B	45	40	35	30	25	20	15	10	5	0			30	
C	9	8	7	6	5	4	3	2	1	0			10	
X	200	100	90	80	70	60	50	40	30	0			5	
Y	4	4	3	3	2	2	1	1	0	0			5	
Z	500	250	100	80	60	40	20	15	10	5			5	
											Total Index Wt.=		100	
			Baseline				Goal			Stretch Goal				

c:\files\excel\index\step06.xls **Index Score=**

Step 7

In the "Value" column, insert the actual number from the period of comparison.
If your reviews are set up for quarterly, you may have had 333 incidents of performance indicator A during that period.

Performance Index

Performance Period =

	Performance Level										Calculations			
Performance Indicator	1	2	3	4	5	6	7	8	9	10	Value	Level	Wt.	Score
A	500	450	400	350	300	250	200	150	100	50	333		45	
B	45	40	35	30	25	20	15	10	5	0	50		30	
C	9	8	7	6	5	4	3	2	1	0	2		10	
X	200	100	90	80	70	60	50	40	30	0	14		5	
Y	4	4	3	3	2	2	1	1	0	0	3		5	
Z	500	250	100	80	60	40	20	15	10	5	4		5	
											Total Index Wt.=		100	
			Baseline				Goal			Stretch Goal				

c:\files\excel\index\step07.xls **Index Score=**

Step 8

There are ten numbers, one through ten, corresponding to Performance Level at the top of the matrix. Knowing your actual value, find the nearest performance level corresponding to that value. Enter the performance level integer under the section "Calculations, Level" in the matrix.

Performance Index														
Performance Period =														
	Performance Level										Calculations			
Performance Indicator	1	2	3	4	5	6	7	8	9	10	Value	Level	Wt.	Score
A	500	450	400	350	300	250	200	150	100	50	333	4	45	
B	45	40	35	30	25	20	15	10	5	0	50	1	30	
C	9	8	7	6	5	4	3	2	1	0	2	8	10	
X	200	100	90	80	70	60	50	40	30	0	14	10	5	
Y	4	4	3	3	2	2	1	1	0	0	3	4	5	
Z	500	250	100	80	60	40	20	15	10	5	4	10	5	
											Total Index Wt.=		100	
			Baseline				Goal			Stretch Goal				
c:\files\excel\index\step08.xls												Index Score=		

Step 9

Simply multiply the "Level" by the "Wt." to determine the "Score" for each indicator. Enter the product in the "Calculations, Score" column of the matrix.

Performance Index														
Performance Period =														
	Performance Level										Calculations			
Performance Indicator	1	2	3	4	5	6	7	8	9	10	Value	*Level x*	*Wt.* =	Score
A	500	450	400	350	300	250	200	150	100	50	333	*4*	*45*	180
B	45	40	35	30	25	20	15	10	5	0	50	*1*	*30*	30
C	9	8	7	6	5	4	3	2	1	0	2	*8*	*10*	80
X	200	100	90	80	70	60	50	40	30	0	14	*10*	*5*	50
Y	4	4	3	3	2	2	1	1	0	0	3	*4*	*5*	20
Z	500	250	100	80	60	40	20	15	10	5	4	*10*	*5*	50
											Total Index Wt.=		100	
			Baseline				Goal			Stretch Goal				
c:\files\excel\index\step09.xls												Index Score=		

Step 10

Sum the individual scores and place the result in the "Index Score" block of the matrix. The index is developed so that the score will not exceed 1000.

Performance Index														
Performance Period =														
	Performance Level										Calculations			
Performance Indicator	1	2	3	4	5	6	7	8	9	10	Value	Level	Wt.	Score
A	500	450	400	350	300	250	200	150	100	50	333	4	45	180
B	45	40	35	30	25	20	15	10	5	0	50	1	30	30
C	9	8	7	6	5	4	3	2	1	0	2	8	10	80
X	200	100	90	80	70	60	50	40	30	0	14	10	5	50
Y	4	4	3	3	2	2	1	1	0	0	3	4	5	20
Z	500	250	100	80	60	40	20	15	10	5	4	10	5	50
											Total Index Wt.=		100	
c:\files\excel\index\step10.xls			Baseline				Goal			Stretch Goal		Index Score=		410

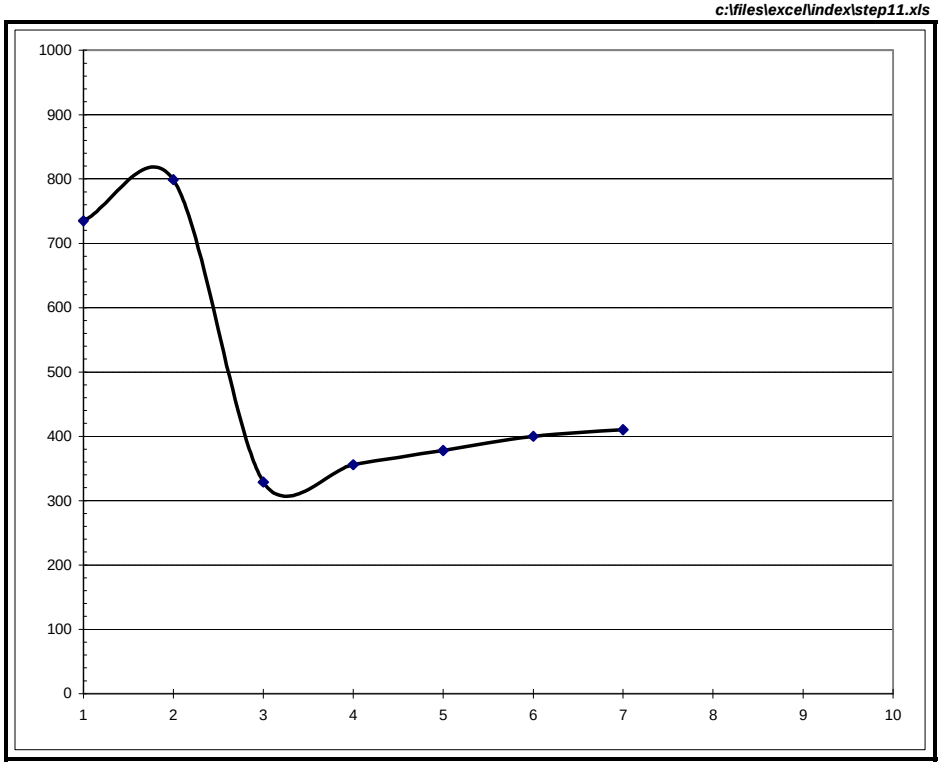
Step 11

Plot this measurement period's score on a graph along with previous measurement periods. This is the final result of the index.

PERFORMANCE INDEX GRAPH

Performance Period	Index Score
1	735
2	799
3	329
4	356
5	378
6	400
7	410
8	
9	
10	

c:\files\excel\index\step11.xls



CONCLUSION

It should be apparent how the index has simplified the review process. Management has hopefully been spared the task of pouring over data from many different performance indicators covering some period of time. With a simple glance at the graph the overall trend and condition of the program is discernible. If the trend is downward (poor) then the individual indicators can easily be reviewed to determine the poor performing ones. Once the suspect indicators have been identified then efforts can be instituted to correct the problem. Simple fluctuations within the acceptable performance area are to be expected. The "acceptable" performance area is defined as being between your baseline and your goal, reflected on the graph's "Y" axis as being between 300 and 700. A score below 300 indicates a severe problem that should be immediately addressed. A score above 700 indicates an extremely well run program that is meeting or exceeding its predetermined goals.